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ABSTRACT

In this paper, an instructor at Miami University Middletown (Ohio) describes how Authorware (by Macromedia) proved to be a valuable tool in developing interactive computer tutorials for physics instruction. Obstacles to improved instruction that had presented themselves were as follows: (1) some of the students' learning styles were not being addressed with current delivery strategies; (2) commuting students with work/family obligations have restricted hours that they can study or do homework; and (3) commercial computer software or video materials are usually costly and not tailored to meet students' needs. Authorware is an icon-based, nonlinear interactive presentation development package that allows for branching, and thus more student control. It automatically sets a program to track several variables, which is very helpful for tracking scores. Authorware allows the user to animate objects, embed sounds and video, and receive user input in multiple ways. The new version of Authorware has online help and complete manuals. Authorware is a prohibitive cost for most budgets compared to the Authorware Academic with few differences, although Academic lacks Open Data Base Connectivity. Afterburner is a small freeware program by Macromedia available from their homepage that breaks up a packaged Authorware piece into chunks that are suitable to send over an Intranet or Internet without considerable time lag. (AEF)

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TO THE EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)

Using Authorware and Shockwave to Create Interactive HTML Pages

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Abstract

My goal as an instructor is to increase student learning by improved teaching methods. One road block to improved instruction in my introductory physics courses is that some of the student's learning styles are not being addressed with my delivery strategies. Another problem that has become more significant is that my students commute and tend to work and/or have family obligations as well as their school responsibilities. This restricts the hours that they can study and do homework. A third problem I have encountered is that commercial teaching materials such as computer software or video materials are usually costly and are not tailored to me or my students' needs. The solution I have found to solve these problems is using Authorware to produce interactive computer tutorials. This paper focuses on these problems and why I have found this to be a reasonable solution. I would like to point out that Macromedia, the producers of Authorware and Shockwave, have in no way sponsored or influenced this paper nor am I trying to advertise for their company.

Problems

Miami University Middletown is a regional campus of Miami University located in south western Ohio. The campus is totally a commuter campus with a combination of traditional and nontraditional students. The nontraditional students are older and tend to have full or part-time jobs and family obligations. Many of the traditional students have jobs as well. I teach an introductory algebra based physics course and an introductory calculus based physics course with accompanying laboratories. The students that take my courses are from a variety of backgrounds and majors. The majority are pre-health field majors or 2 and 4 year engineering majors. This varying array of students brings with them a variety of instructional needs and challenges.

One of these challenges is meeting the variety of learning styles these students possess. I have found this to be especially significant in physics. There is a lot of information and research on learning styles based on D. A. Kolb's original work. I will not go into much depth here. There are three general ways that students receive information: auditory, visual, and kinesthetic. Students tend to favor one of the three. It is not sufficient to just lecture [1]. This only helps the visual and auditory learners. But even the visual depictions are not sufficient when talking about two or three dimensional subjects. I have seen this first hand in my courses. Drawing a graph of position versus time for a moving car is not as effective for some students as seeing a toy car drive across the desk.

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It is impossible to teach all topics in all three modes. And what about those students who need to see it several times? Computers can show some of these more complex topics with ease. For example showing how vectors add or harmonic motion relates to circular motion can be shown with animations for the students to repeat as often as needed.

Another challenge is meeting the diverse scheduling needs of my students. Our campus is nonresidential and our students commute anywhere from 5 minutes to an hour away. We serve part time and full time students and offer classes from 8:30 a.m. to 10:00 p.m. This means that our students may be needing assistance at 2:00 a.m., or 6:00 a.m., or whenever they can squeeze a moment to study. Well, I do not keep office hours like that, but the Internet is always available. It allows students to study at their convenience and at their own pace. That is very important to our mission as a University.

The last challenge is that there is an overwhelming amount of commercial computer material available for instructors. I have found it to be costly and difficult to fit into my curriculum. This is very frustrating. It is time consuming to screen all of the material. I am not saying there is not good software out there, but if it drives changes in my content and teaching style, it is not helpful. By creating my own materials, I can tailor it to how I teach and what I teach. I still use some commercial materials, but it really is worth the time to me to match my classroom work.

Solution

I looked to the computer to solve these problems. It is capable of delivering sound, video, and text to address varied learning styles. The Internet can deliver material at nearly any location at any time of day, and I can create materials that match my curriculum and teaching style. The task was to choose the software to create this material and find out how to deliver it over the Internet with relatively good speed.

I look for three things when I am evaluating developing software for classroom use: functionality, learning curve, and cost. If a program is very powerful but takes months to learn, then it is not very useful. On the other hand if it is very easy to learn but not very functional, that does not solve the problem either. Budget is always a concern and software must be affordable. Unfortunately the more functional the software, the more expensive it seems to be. Fortunately some companies offer educational versions of their software at reduced rates.

I can not claim to have investigated all the available software on the market, but I did look at many different programs and options. I also talked with other instructors and computer "gurus" including some students to find out what was out there. The software I have decided to use for developing applications is Authorware by Macromedia.

Why Authorware?

Authorware is an extremely powerful developing tool. It is what I would term a nonlinear interactive presentation developing package. Let me explain. Programs such as PowerPoint are excellent presentation packages but are linear. You can only go forward or backward. If the learner wants to go to another part of the program, they must move forward through the rest of the program to get

there. There is no branching. I wanted more student control. Students will get frustrated if they cannot make some choice about where they go or repeat some topics they may have missed. Authorware allows for branching. A student can choose where they want to go next. I can also change the program direction based on students' input.

Another part of its functionality is its built in variables and functions. It automatically sets your program up to track several variables. This is very helpful when tracking scores. I can also set up my own variables if I choose to get that complicated. Functions can help the users run the program or perform specific tasks.

Authorware allows you to animate objects, embed sounds and video, and receive user input in multiple ways. The animation feature may sound like nice bells and whistles but I find it a very useful innovation. It allows for illustration of motion of various objects which is very useful in physics. For real life motion or demonstrations, short video can be embedded. The feature that adds flexibility and interaction is the user input. Students can interact with the material by answering questions, matching terms, or building lab models. The possibilities are endless.

Authorware is obviously functional, but is it very user friendly? I must admit that my first encounter with Authorware was less than friendly. But in that version there was no online help and the written manuals were not always helpful. But this new version has online help and complete manuals. The learning curve is not completely smooth but is not as steep as many other programs with the same functionality. Another nice feature is that even if you only master the basics, you can still produce useful applications. Director, also by Macromedia, has a steeper learning curve to me and requires scripting for more complex actions. I find this to be a huge deterrent. Authorware is icon based. Give me picture programming over a text based language any day. Figure 1 shows an example of an Authorware program flow line.

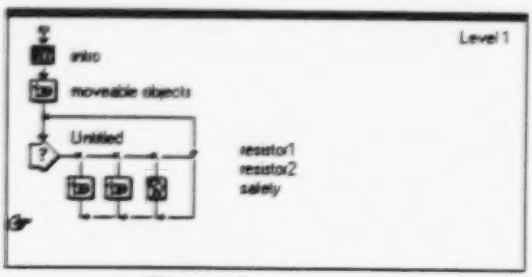


Figure 1

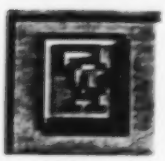
This figure shows that it begins with some introduction group followed by some moveable objects and then a question requiring student input. No programming knowledge needed. And if you forget something, Authorware will remind you that some direction is needed at a given point as the application runs. One of the best advantages is that Authorware comes prepackaged with some useful educational applications that can be inserted into your application or fitted with your material. You do not have to reinvent the wheel, just modify the paint job.

Other programs which could be considered are Asymetrix Toolbook, HyperCard, and Visual Basic. Visual Basic involves much to much programming for my tastes. I know a lot of instructors who like Toolbook. It is a HyperCard clone. It is much more expensive than the Academic version of Authorware.

That brings me to price. Let's face it, there are not a lot of large budgets in academia. Price is a driving force in choosing equipment. Macromedia has met that need by providing academic versions of their production software. Authorware is a $900 program, a prohibitive cost for most budgets. But their Authorware Academic version is about $150. There are a few differences between the two versions. Authorware Academic is limited to 350 icons which I will never approach, and there is a 20 variable limit. The only limit I find frustrating is the lack of Open Data Base Connectivity. This would allow you to connect with a data base and keep track of student progress more easily, but there are ways to get around this limitation. Finally you cannot create a completely executable file like in Authorware. You have to include the RunA3W file with your final application. This is a minor inconvenience.

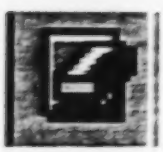
Producing an Application with Authorware Academic

Obviously I cannot cover all the specifics of producing an Authorware application in this paper. But I will give an overview that captures the essence of how Authorware works that would allow the ambitious to experiment [2]. There are only 13 main icons in Authorware which is remarkably simple for the functionality of the program.



The **display** icon is placed in the flow line where you want to put any type of pictures or text. The major thing to remember is that it is helpful to give a set of text or a picture its own icon. It makes things easier later.

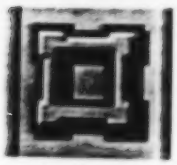
The **motion** icon is what makes animation so easy. It adds life to the traditional black board examples. Text, objects, or movies can be moved in a variety of ways. It is not just for flash either.



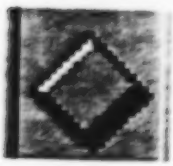
The **erase** icon just erases what you no longer want on the display. It comes complete with fancy transitions.

The **wait** icon slows the program up for a given amount of time or until the user is ready to go on.

This **navigation** icon is used in conjunction with the framework icon to navigate an application. It allows you to mimic the HyperCard structure of other programs.

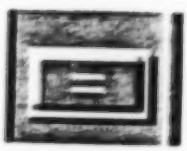


The **framework** icon is used to mimic the HyperCard structure.

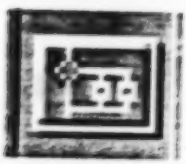


The **decision** icon allows for change in path depending upon conditions or events.

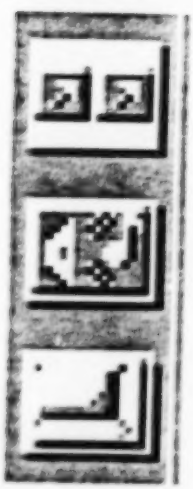
The **interaction** icon is the key to interactions with the user. Students can respond to questions and get feed back on their choices.



The **calculation** icon is used for more complicated actions. It can manipulate variables and run functions.



The **grouping** icon makes the program more manageable by combining icons into a group.



These three icons allow you to place video and sound into the flow line and the third allows you to start up external video tape from within the application.

To create an application you combine these icons into a flow line in the order you want them to appear. As you begin to create you can run the application at any time to see exactly how it is going to look to the user. If more information is needed , the application stops and asks you for the missing information. It is best to start out simple and build. Another way to learn is to look at some of the applications included with Authorware. They are especially geared toward education. Some of them are structured so that all you do is add your material. You can use materials that you have already created. Bitmap (BMP) graphics can be cut and pasted into Authorware and text can be inserted as long as it is in Rich Text Format (RTF). This can save time if you happen to have notes or handouts that you would like to put into your application.

Once your application is running as you want it to, you must package it. It becomes a file that can run on any computer. You must include the RunA3W program with your file, but that is not a big deal. You can distribute your application on disk , as long as it is small enough, or put it on a server for network use for your students. This in itself is a nice feature but I think the real advantage is putting an application on the World Wide Web.

Afterburner/Shockwave

Afterburner is a small freeware program put out by Macromedia. It is available from their home page [http://www.macromedia.com]. Afterburner takes your packaged Authorware piece and takes it one step farther. It breaks into "chunks" that are of suitable size to send over a Intranet or Internet without considerable time lag. It also creates a mapping file that keeps it all organized. These "chunks" and the mapping file are then placed on a server. Some minor things must be done to the server in order for this to work, but I will leave that up to the programmers. It is outlined in Afterburner.

The next step is to embed your piece into an HTML document. You must use the embed tag as illustrated below.

<embed src = "name of your file" width = ### height = ###>
<noembed> </noembed>

You must specify the height and width of the window for the browser to show the whole piece.

Finally, in order to view the final piece with a browser, you must install the Shockwave plugin on your computer. This is one of the most popular plugins and will probably become standard issue someday. It can also be downloaded from Macromedia for free. The students should not have too many problems taking care of this, but some instruction may be warranted. Now you are ready to view your piece and interact with it over the Internet.

Intranet Vs Internet

The Internet is the world wide system with which we can all have access. An Intranet is a system of linked computers that is smaller and usually confined to a computer center or classroom. It is separated from the Internet at large. Bandwidth is the concern. Bandwidth deals with the amount of data the network cabling can transmit in a given amount of time. Any piece that you create would be fine for an Intranet because bandwidth is not an issue and the download time is not as long. But if you start creating elaborate pieces with video and sound, be aware that the download time over the Internet could be long depending again on bandwidth. I try to keep it somewhat

simple so that is not such a problem. I am presently experimenting with short video pieces. These could create a problem. My rule of thumb is that if it takes longer than a minute to download it will frustrate the students. Shockwave avoids some of this by downloading packets at a time.

Conclusion

The World Wide Web is the hottest topic in business, education, and information systems. The extent of its impact on our society is yet untold. We as educators can use this technology to improve our delivery of information to our students. There are many ways to utilize Internet technology in the classroom. Several advantages of the Web is that it can address student's various learning styles. It is possible to be visual, auditory, and kinesthetic to some extent. The Web is also very flexible. A student can work on material from the Internet at any time of day or night. This flexibility is especially valuable when the students commute or work as well as attend school. The Web can merely function as a video "book" or it can require interaction by the user. This is where the Internet can become a powerful teaching tool. Dissemination of information is not the only goal of teaching. Involving the student in the educational process is essential.

References:

1. Sternberg, Robert J., "Allowing for Thinking Styles," *Educational Leadership* (November, 1994).

2. Allen, Michael W., Authorware Academic Users Guide Version 3.5, Prentice Hall, Upper Saddle River, New Jersey, 1966.